

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-219

A. D. Wanamaker Jr. (Referee)

Referee comment on "Investigating controls of shell growth features in a foundation bivalve species: seasonal trends and decadal changes in the California mussel" by Veronica Padilla Vriesman et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-219-RC2>, 2021

The manuscript is clearly written and the results suggest that the banding pattern (light and dark couplets) in *Mytilus californianus* is largely associated with environmental conditions. A real strength of the study is the abundant environmental data from which the shells were collected. This allowed the authors to investigate which parameters might be most important in controlling the light and dark banding in the shell.

I mostly have some small suggestions that will hopefully make your statements/conclusions a bit stronger and a few editorial suggestions that might improve the flow of the manuscript. Overall, I think this is a strong contribution to the field of sclerochronology.

Bigger considerations:

- If you provided additional evidence from x-ray diffraction (XRD) that you have three distinct mineral layers, that would be stronger than the optically derived evidence.

Because this is a major finding of this study, this additional line of evidence is warranted. Furthermore, this will be the “go to paper” to cite this mineralogical finding. XRD is quick and relatively inexpensive.

- Do you have modern shells from Portuguese Beach? If not, you are “making the argument” that site 3 and site 2 (open coast environments) are similar enough to suggest that changes in shell growth between the modern and archival specimens is related to time dependent growth changes rather than a difference in growth from two different locations (i.e., growth is different because they are at different sites). I think it is warranted to add something to the discussion about this assumption.

Smaller considerations:

- Line – 39 – after ~ 500 years add Butler et al., 2013; Butler, P. G., A. D. Wanamaker, J. D. Scourse, C. A. Richardson, and D. J. Reynolds (2013), Variability of marine climate on the North Icelandic Shelf in a 1357-year proxy archive based on growth increments in the bivalve *Arctica islandica*, *Palaeogeography Palaeoclimatology Palaeoecology*, 373, 141-151, doi: 10.1016/j.palaeo.2012.01.016
- Line 40 – not everyone would support this statement about obvious/clear daily growth increments in *A. islandica*. Better to say Schone et al concluded ...
- Table 1 – consider adding Wanamaker et al 2008 for Mg/Ca in *Mytilus edulis*

Wanamaker, A. D., K. J. Kreutz, T. Wilson, H. W. Borns, D. S. Introne, and S. Feindel (2008), Experimentally determined Mg/Ca and Sr/Ca ratios in juvenile bivalve calcite for *Mytilus edulis*: implications for paleotemperature reconstructions, *Geo-Marine Letters*, 28(5-6), 359-368.

We found differing Mg/Ca ratio relationships based on ambient seawater salinity. Thus, there is likely a physiological response/control over elemental incorporation.

- I think the last paragraph in the Introduction should be the aims of the study. Thus, I suggest making the paragraph (line 75) about banding the first paragraph of the Introduction. I think the Introduction lost clarity after reading about the aims which was followed by a very broad discussion of banding.
- Line 116 – add standard deviation to salinity range and report if it is 1 or 2 standard deviations.
- I found figure 6 a bit confusing/hard to follow. Perhaps adding “range” to Seasonal SST for the x-axis on panel B would eliminate the possibility of thinking panels A and b are nearly identical.
- Line 390- onward – high resolution sampling (representing weekly or so) of oxygen isotopes in the outer calcite layer would help solve this issue right? Is this planned? Some discussion of this possibility is warranted in the Discussion (or future work?).
- Also, when considering future work, Goodwin et al found that *Mercenaria mercenaria* clams grew during the warmest part of the day throughout the year whereas oysters in the same setting had no preference. If we were to sample these clams and oysters for oxygen isotopes, we might then conclude that they grew in different environments, but they did not. Thus, I wonder if monitoring daily high and low temperatures might provide some additional insight on your work. This is just a thought- no action needed.

Goodwin, D.H., Gillikin, D.P., Jorn, E.N., Fratian, M.C., and Wanamaker, A.D., (2021) Comparing contemporary biological archives from *Mercenaria mercenaria* and *Crassostrea virginica*: Insights on paleoenvironmental reconstructions, *Palaeogeography, Palaeoclimatology, Palaeoecology*, 562, doi.org/10.1016/j.palaeo.2020.110110.